

AD-A077 639      BAKER (MICHAEL) JR INC BEAVER PA

NATIONAL DAM SAFETY PROGRAM. SOUTH RIVER NUMBER 23 (VA 01508), --ETC(U  
SEP 79 J A WALSH

F/G 13/13

DACW65-78-D-0016

NL

UNCLASSIFIED

/ OF |  
AD  
A0776 39



END

DATE

FILMED

| - 80

DDC

POTOMAC RIVER BASIN

Name of Dam: South River No. 23

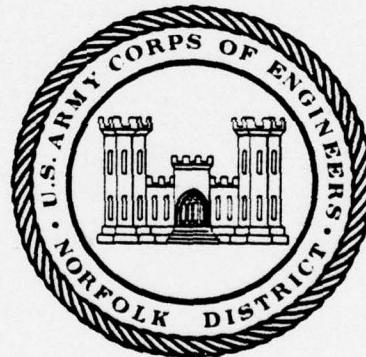
Location: Augusta County, State of Virginia

Inventory Number: VA 01508

(1) B.S. -  
LEVEL II

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

ADA 077639



DDC  
R  
DEC 3 1979  
RESULT  
A

PREPARED FOR  
NORFOLK DISTRICT CORPS OF ENGINEERS  
803 FRONT STREET  
NORFOLK, VIRGINIA 23510

DDC FILE COPY

PREPARED BY  
MICHAEL BAKER, JR., INC.  
BEAVER, PENNSYLVANIA 15009

DISTRIBUTION STATEMENT A  
Approved for public release  
Distribution Unlimited

SEPTEMBER 1979

79 11 30 045

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER VA 01508	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program SOUTH RIVER NO. 23 Augusta County, State of Virginia		5. TYPE OF REPORT & PERIOD COVERED
7. AUTHOR(s) Michael Baker, Jr., Inc. Beaver, Pennsylvania 15009		6. PERFORMING ORG. REPORT NUMBER <b>(15) DACW 65-78-D-0016</b>
9. PERFORMING ORGANIZATION NAME AND ADDRESS <b>(16) James A. Walsh</b>		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineering District, Norfolk 803 Front Street Norfolk, VA 23510		12. REPORT DATE <b>(11) September 1979</b>
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) National Dam Safety Program, South River Number 23 (VA 01508), Potomac River Basin, Augusta County, State of Virginia.		13. NUMBER OF PAGES <b>(12) 53</b>
16. DIS Phase I Inspection Report		15. SECURITY CLASS (of this report) <b>(12) 53</b>
Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams - VA National Dam Safety Program Phase I Dam Safety Dam Inspection		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  (See reverse side)		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

410795 SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

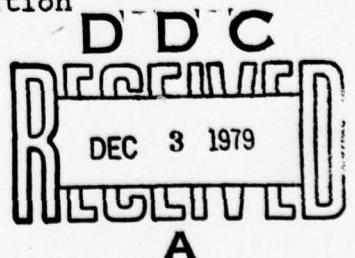
## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



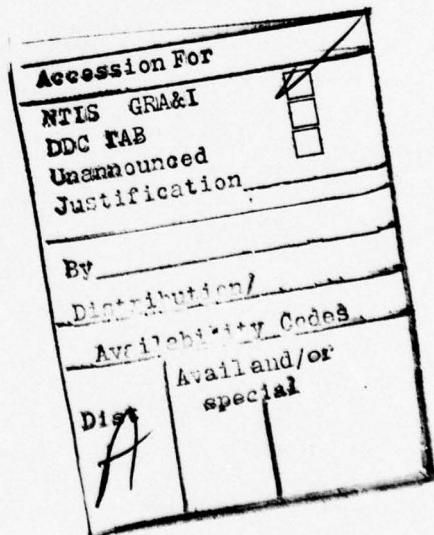
PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

CONTENTS

	<u>Page</u>
Preface . . . . .	i
Brief Assessment of Dam . . . . .	1
Overall View of Dam . . . . .	5
Section 1: Project Information . . . . .	7
Section 2: Engineering Data . . . . .	11
Section 3: Visual Inspection . . . . .	13
Section 4: Operational Procedures . . . . .	15
Section 5: Hydraulic/Hydrologic Data . . . . .	17
Section 6: Dam Stability . . . . .	21
Section 7: Assessment/Remedial Measures . . . . .	23

Appendices

- I. Plates
- II. Photographs
- III. Check List - Visual Inspection
- IV. Check List - Engineering Data
- V. Operation and Maintenance Inspection Reports
- VI. General References



NAME OF DAM: SOUTH RIVER No. 23

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam: South River No. 23  
State: Virginia  
County: Augusta  
USGS 7.5 Minute Quadrangle: Waynesboro West, VA  
Stream: Robinson Hollow Run  
Date of Inspection: 7 June 1979

BRIEF ASSESSMENT OF DAM

South River No. 23 dam is an earthfill embankment approximately 450 feet long and 49 feet high. The dam, located on Robinson Hollow Run approximately 4 miles south of Waynesboro, Virginia, is used for flood control. South River No. 23 dam is an "intermediate" size - "high" hazard structure as defined by the Recommended Guidelines for Safety Inspection of Dams. Visual inspection and office analyses indicate no deficiencies requiring emergency attention.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the Probable Maximum Flood (PMF) was selected as the spillway design flood (SDF). The PMF was routed through the reservoir and found to overtop the dam by a maximum depth of 2.3 feet with an average critical velocity of 4.0 f.p.s. Total duration of dam overtopping would be approximately 2.0 hours. The spillways are capable of passing only 55 percent of the PMF and are therefore considered inadequate.

It is recommended that the following remedial measures be accomplished as part of the annual maintenance program: investigate the need to extend the berm separating the right emergency spillway discharge channel from the downstream embankment, repair and seed eroded areas caused by jeep traffic on the embankment slope, seed poorly vegetated areas on the upstream embankment slope, regrade small slumps and seed bare areas in emergency spillways, clear brush from around outlet structure, lower water level in stilling pool to eliminate backwater into seepage drain outlet, and provide additional riprap in stilling basin as required.

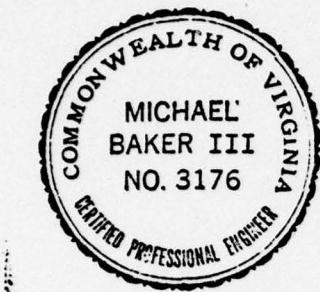
NAME OF DAM: SOUTH RIVER No. 23

MICHAEL BAKER, JR., INC.

SUBMITTED:

*LB*

Michael Baker, III, P.E.  
Chairman of the Board and  
Chief Executive Officer



Original signed by  
JAMES A. WALSH

James A. Walsh  
Chief, Design Branch

ORIGINAL SIGNED BY:

J. R. PHILPOTT

for Jack G. Starr  
Chief, Engineering

Original signed by:  
Douglas L. Haller

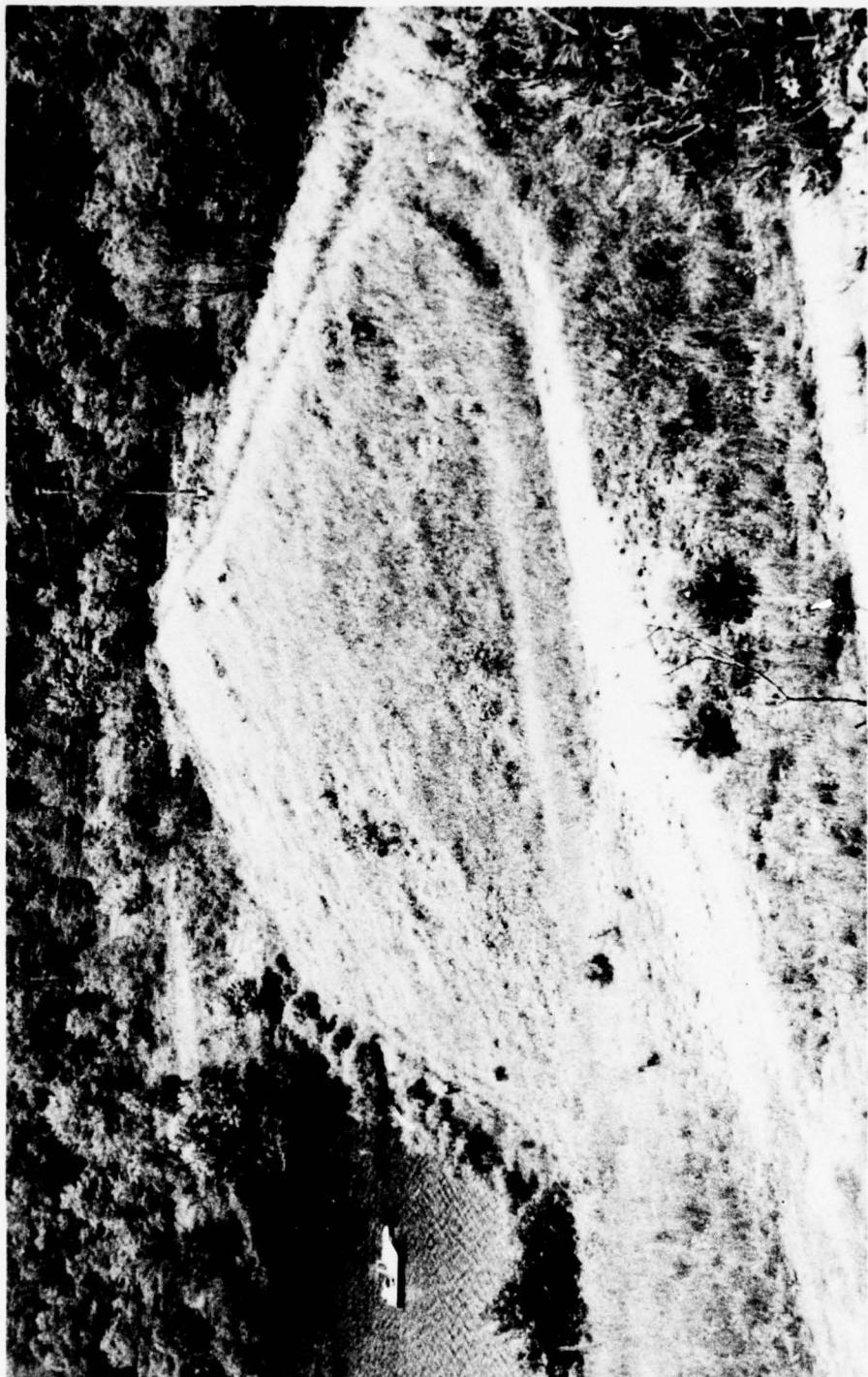
Douglas L. Haller  
Colonel, Corps of Engineers  
District Engineer

SEP 21 1979

Date: \_\_\_\_\_

NAME OF DAM: SOUTH RIVER No. 23

**OVERALL VIEW OF DAM**



PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NAME OF DAM: SOUTH RIVER No. 23 ID# VA 01508

SECTION 1 - PROJECT INFORMATION

1.1 General

- 1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.
- 1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

- 1.2.1 Description of Dam and Appurtenances: South River No. 23 dam is an earthfill embankment approximately 49 feet high<sup>1</sup> and 450 feet long with upstream and downstream slopes of 2.5:1 (horizontal to vertical) and a crest width of 20 feet (see Overall View of Dam and Photo 1). A 10 foot berm is provided on the downstream slope at elevation 1476.0 feet Mean Sea Level (M.S.L.).<sup>2</sup> Seepage through the dam is collected by a drainage system which exits through an 8 inch diameter corrugated metal pipe at the left<sup>3</sup> of the outlet conduit at the toe of the dam (see Plate 1).

The principal spillway is a drop-inlet type structure consisting of a 5 foot square reinforced concrete riser (see Photos 2 and

<sup>1</sup>Measured from the streambed at the downstream toe to the embankment crest.

<sup>2</sup>All elevations are referenced to the normal pool elevation of 1470.0 feet M.S.L. as indicated on the Waynesboro West, Virginia 7.5 minute USGS Quadrangle.

<sup>3</sup>Facing downstream.

NAME OF DAM: SOUTH RIVER No. 23

3). A 24 inch diameter reinforced concrete pipe discharges into a plunge pool approximately 300 feet from the riser at the downstream toe of the embankment (see Photo 4). The crest elevation of the drop-inlet is 1470.0 feet M.S.L. A manually operated sluice gate located on the upstream side of the riser can be used to drain the reservoir. A wooden trash rack is constructed on top of the riser to prevent blockage of the spillway with debris.

Vegetated earth emergency spillways are located on each side of the embankment (see Plate 1). The spillway on the right side of the embankment has a 20 foot wide control section with a crest elevation of 1496.0 feet M.S.L. The left spillway has a 50 foot wide control section and a crest elevation of 1496.5 feet M.S.L. (see Photo 5). Both spillways are trapezoidally shaped (side slopes varying from 2:1 to 3:1) and discharge into the stream channel below the dam.

- 1.2.2 Location: South River No. 23 is located on Robinson Hollow Run approximately 1.5 miles upstream from the confluence with Back Creek. The dam is situated on the edge of the George Washington National Forest, Augusta County, Virginia, approximately 4 miles south of the City of Waynesboro, Virginia.
- 1.2.3 Size Classification: The maximum height of the dam is 49 feet; the reservoir storage capacity to the crest of the dam, elevation 1504.1 feet M.S.L., is 919 acre-feet. Therefore the dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.
- 1.2.4 Hazard Classification: Several homes are situated in low-lying areas along Back Creek approximately 2 miles downstream from the dam. Approximately 3 miles below the dam, Back Creek discharges into South River which, in turn, flows through the City of Waynesboro approximately 5 miles downstream from the dam. Since loss of life, as well as extensive economic losses, could occur in the event of a dam failure by overtopping, the dam is classified in the "high" hazard category as defined in the Recommended Guidelines for

NAME OF DAM: SOUTH RIVER No. 23

Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

- 1.2.5      Ownership: This dam is owned by Robin Hollow, Inc. of Waynesboro, Virginia. Owner's contact is Mr. J. Marvin Stoner of Waynesboro, Virginia.
- 1.2.6      Purpose: The dam is used for flood control.
- 1.2.7      Design and Construction History: The dam and appurtenances were designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS). The dam, completed in 1956, was built by the A.B. Burton Construction Company.
- 1.2.8      Normal Operational Procedures: The reservoir is maintained at the normal pool elevation of 1470.0 feet M.S.L. No formal operating procedures are followed for the dam. For a more detailed operating assessment, see paragraph 4.1.

1.3      Pertinent Data

- 1.3.1      Drainage Area: The drainage area tributary to South River No. 23 is 2.35 square miles.
- 1.3.2      Discharge at Dam Site: The maximum flood occurred in June 1972 during Tropical Storm Agnes. During this storm the reservoir rose to an elevation of approximately 1497.5 feet M.S.L. This corresponds to a maximum discharge from the reservoir of approximately 300 c.f.s.
- Principal Spillway:  
Pool level at top of dam . . . 49 c.f.s.
- Emergency Spillways:  
Pool level at top of dam . . . 7000 c.f.s.
- 1.3.3      Dam and Reservoir Data: Pertinent data on the dam and reservoir is shown in the following table:

NAME OF DAM: SOUTH RIVER No. 23

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet M.S.L.	Area acres	Reservoir Capacity			Length feet
			Acre- feet	Watershed inches		
Top of dam	1504.1	47.0	919	7.3	2600	
Left emergency spillway crest	1496.5	37.0	600	4.8	2300	
Right emergency spillway crest	1496.0	36.5	580	4.6	2250	
Principal spillway crest (normal pool)	1470.0	7.4	37	0.3	850	
Streambed at downstream toe of dam	1455+	-	-	-	-	-

NAME OF DAM: SOUTH RIVER No. 23

## SECTION 2 - ENGINEERING DATA

- 2.1 Design: No design information was available for use in the preparation of this report.
- 2.2 Construction: The dam was constructed in 1956 by the A.B. Burton Construction Company. Construction records, as-built plans, and inspection logs were not available for review.
- 2.3 Operation: There are no formal operation records.
- 2.4 Evaluation: No stability analyses or hydrologic and hydraulic data was available for review. No construction records or as-built plans were available to adequately assess the condition of the dam. All evaluations and assessments in this report were based upon field observations and office analyses.

NAME OF DAM: SOUTH RIVER No. 23

### SECTION 3 - VISUAL INSPECTION

#### 3.1 Findings

3.1.1 General: The field inspection of South River No. 23 was conducted on 7 June 1979 during sunny, warm weather. The water level at the time of the inspection was at normal pool and ground conditions were dry. The dam and appurtenant structures were generally found to be in good condition. The small problems which were noted included minor erosion on the embankment and hillside cuts of the emergency spillways and partial inundation of the seepage drain outlet.

Plate 1 is a Field Sketch of the facility which depicts the conditions observed during the visual inspection. The complete visual inspection check list is included in Appendix III. Following are summaries of the deficiencies noted during the inspection.

3.1.2 Dam: The upstream and downstream embankment slopes are 2.5:1. A few sparsely vegetated areas are located on the upstream embankment slope which are prone to erosion. Small trees have also been allowed to root on the upstream slope at the waterline. Jeeps have traversed numerous parts of the dam as shown on Plate 1. This jeep traffic has caused minor erosion of the ends of the dam bordering the emergency spillways (see Overall View of Dam and Photo 5). Other potential problems are indicated by jeep tracks which cross the upstream slope just above the waterline, the bench on the downstream slope, and all of the abutment slopes. A jeep track is also located on the right side of the downstream embankment slope. Animal burrows were observed in the junction of the upstream embankment slope with the right abutment and the left downstream junction.

3.1.3 Appurtenant Structures: Minor slumps are present in the right emergency spillway hillside cut (see Photo 7). The discharge channel of the right emergency spillway is badly eroded (see Photo 6) and the berm separating the discharge channel from the abutment appears to be insufficient in length.

NAME OF DAM: SOUTH RIVER No. 23

The upstream side of the hillside cut in the left emergency spillway is sparsely vegetated and soft.

The discharge channel immediately surrounding the principal spillway outlet is badly overgrown (see Photos 4 and 8). The water level in the stilling basin is too high and 50 percent of the principal spillway outlet is inundated. A drain pipe, situated approximately 2 feet left of the main outlet, is also inundated by approximately 0.2 foot. Riprap around the outlet pipes is insufficient.

3.1.4

Reservoir Areas: The reservoir slopes are moderately steep and overgrown with trees. No signs of slope instability were observed.

3.1.5

Downstream Channel: The downstream channel in the immediate area of the outlet works is heavily overgrown by dense brush. As explained in Section 3.1.3, the water level in the stilling basin is too high with respect to the principal spillway outlet. The downstream channel below the stilling basin is lined by tree cover.

3.2

Evaluation: None of the above mentioned items are considered to be serious. Jeep traffic should be restricted from the embankment, bare and poorly vegetated areas should be seeded, and trees and brush should be cleared from the dam and appurtenant structures. The berm separating the right emergency spillway discharge channel from the downstream embankment should be re-examined and lengthened if necessary.

NAME OF DAM: SOUTH RIVER No. 23

## SECTION 4 - OPERATIONAL PROCEDURES

- 4.1 Procedures: Operation of the dam is an automatic function maintained by the riser and the two emergency spillways. Normal pool elevation is approximately 1470.0 feet M.S.L. During high inflow periods when the capacity of the principal spillway is exceeded, water rises in the reservoir until it reaches elevation 1496.0 feet M.S.L., the crest elevation of the right emergency spillway. Above this elevation, water will discharge through the right emergency spillway. Water will begin to discharge through the left emergency spillway when the water level rises above elevation 1496.5 feet M.S.L. Drawdown of the reservoir is possible by means of a sluice gate on the riser.
- 4.2 Maintenance of Dam: Maintenance of the dam is provided by the Headwaters Soil and Water Conservation District. Inspections of the dam are made periodically by the Headwaters Soil and Water Conservation Districts' personnel with the assistance of the local SCS office. During these visual inspections (see Appendix V), remedial measures are recommended for corrective maintenance.
- 4.3 Maintenance of Operating Facilities: Maintenance of the operating equipment is provided by the Headwaters Soil and Water Conservation District. The only operational equipment on the dam are the lift pedestal, stem, and sluice gate.
- 4.4 Warning System: At the present time, there is no warning system or evacuation plan in operation.
- 4.5 Evaluation: Maintenance of the dam is considered adequate. The annual maintenance and inspection program provides the means to identify potential problems before they become serious.

NAME OF DAM: SOUTH RIVER No. 23

## SECTION 5 - HYDRAULIC/HYDROLOGIC

- 5.1 Design: No design data was available for use in preparing this report.
- 5.2 Hydrologic Records: No rainfall or stream gage records are maintained at the dam site.
- 5.3 Flood Experience: The maximum flood on record occurred in June 1972 during Tropical Storm Agnes. Water marks after the flood indicated that water reached a depth of 1.0 to 1.5 feet in the emergency spillways.
- 5.4 Flood Potential: Performance of the reservoir by routing the Probable Maximum Flood (PMF) and the 1/2 Probable Maximum Flood (1/2 PMF) is shown in Table 5.1. The flood potential of the reservoir was determined by utilizing the U.S. Army Corps of Engineers' Flood Hydrograph Package, HEC-1 DB, and appropriate unit hydrograph, precipitation, and storage-discharge data. The time of concentration ( $T_c$ ) and Clark's R used in the analysis were estimated from drainage basin characteristics.

The rainfall applied to the unit hydrograph was obtained from the U.S. Weather Bureau (Reference 5, Appendix VI). Rainfall losses were estimated at an initial loss of 1.0 inch and a constant loss thereafter of 0.05 inch per hour.

- 5.5 Reservoir Regulation: Pertinent dam and reservoir data is shown in Table 1.1, paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. During periods of high inflow when the capacity of the principal spillway is exceeded, water rises in the reservoir until it reaches elevation 1496.0 feet M.S.L., the crest elevation of the right emergency spillway. Above this elevation, water will discharge through the right emergency spillway. Water will begin to discharge through the left emergency spillway when the water level rises above elevation 1496.5 feet M.S.L.

Reservoir area and storage capacity were determined by use of the 7.5 Minute USGS Quadrangle for Waynesboro (West), Virginia. Outlet discharge capacity was computed and includes discharges from the principal spillway and both emergency spillways. Flood routings were computed with initial reservoir level at normal pool.

NAME OF DAM: SOUTH RIVER No. 23

- 5.6 Overtopping Potential: The probable rise in reservoir and other pertinent information on reservoir performance for the 1/2 PMF and PMF hydrographs are shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal	1/2 PMF	PMF(a)
Peak flow, c.f.s.			
Inflow	2	7714	15429
Outflow	2	6425	15182
Peak elev., ft. M.S.L.	1470.0(b)	1503.7	1506.4
Left Emergency Spillway (elev. 1496.5 ft. M.S.L.)			
Depth of flow, ft.	-	4.9	6.7
Average velocity, f.p.s.	-	11.4	13.4
Duration of overtopping, hrs.	-	11.2	13.1
Right Emergency Spillway (elev. 1496.0 ft. M.S.L.)			
Depth of flow, ft.	-	5.5	7.6
Average velocity, f.p.s.	-	11.3	12.9
Duration of overtopping, hrs.	-	15.1	17.2
Non-overflow section (elev. 1504.1 ft. M.S.L.)			
Depth of flow, ft.	-	-	2.3
Average velocity, f.p.s.	-	-	
Duration of overtopping, hrs.	-	-	2.0
Tailwater elev., ft. M.S.I. (c)	1450.6	-	-

- (a) The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region.
- (b) All elevations are based on the assumed elevation of 1470.0 feet M.S.L. for normal pool.
- (c) Tailwater at time of inspection.

- 5.7 Reservoir Emptying Potential: The reservoir can be drawdown by means of the 24 inch diameter gated outlet conduit. Neglecting inflow, the reservoir can be drawdown from normal pool in approximately one day.

- 5.8 Evaluation: South River No. 23 is an "intermediate" size - "high" hazard dam requiring evaluation for a spillway design flood (SDF) equal to the PMF. The PMF was routed through the reservoir and found to overtop the dam by a maximum depth of approximately 2.3 feet

NAME OF DAM: SOUTH RIVER No. 23

with an average critical velocity of 4.0 f.p.s. Total duration of dam overtopping would be approximately 2 hours. The spillways are capable of passing approximately 55 percent of the PMF without overtopping the dam.

The SCS design analyses for spillway capacity employs different procedures and parameters than those used in this report.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

NAME OF DAM: SOUTH RIVER No. 23

## SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: Information describing the specific nature of the foundation and abutments was not available for this evaluation. Bedrock in this area consists of Cambrian sandstones, shale, and quartzite of the Hampton Formation. Sandstone outcrops were observed during the visual inspection in the road beds which traverse the emergency spillways. Faulting is indicated in this area on the State Geologic Map.

### 6.2 Stability Analysis

6.2.1 Visual Observations: No tension cracks, bulging, seeps, or other signs indicating instability were observed during the visual inspection. The embankment slopes are 2.5:1. The downstream embankment slope is interrupted by a 10 foot wide bench at elevation 1476.0 feet M.S.L.

6.2.2 Design Data: Design data was unavailable for this evaluation.

6.2.3 Operating Records: Inspection reports from the Headwaters Soil and Water Conservation District are included in Appendix V.

6.2.4 Post-Construction Changes: No significant post-construction changes are apparent.

6.2.5 Seismic Stability: South River Dam No. 23 is situated in Seismic Zone 2 and is considered to have no hazard from earthquakes, according to the Recommended Guidelines for Safety Inspection of Dams, provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: No evidence of instability was observed during the field inspection or during previous maintenance inspections.

NAME OF DAM: SOUTH RIVER No. 23

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

- 7.1 Dam Assessment: The dam and appurtenant structures are generally in good overall conditions. No deficiencies were discovered during the field inspection or office analyses which would indicate the need for emergency attention.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the PMF was selected as the SDF for the "intermediate" size - "high" hazard classification of South River No. 23. The PMF was routed through the reservoir and found to overtop the dam by a maximum depth of 2.3 feet with an average critical velocity of 4.0 f.p.s. Total duration of dam overtopping would be approximately 2.0 hours. The spillways are capable of passing approximately 55 percent of the PMF, and therefore are considered inadequate.

No evidence of instability such as seepage or movement of the embankment was detected during the field inspection. The berm separating the right emergency spillway discharge channel from the downstream embankment should be re-examined and lengthened if necessary.

The following recommended remedial measures are not considered urgent and may be accomplished as part of the general maintenance of the dam.

- 7.2 Recommended Remedial Measures: The following repair items should be completed as part of the general yearly maintenance of the dam.

- 1) Investigate the need of extending the berm separating the right emergency spillway discharge channel from the downstream embankment.
- 2) Restrict jeep traffic from the embankment to prevent further erosion. Repair and seed eroded areas.
- 3) Seed the poorly vegetated areas on the upstream embankment slope.
- 4) Regrade small slumps in the hillside of the right emergency spillway and seed this area and the sparsely vegetated areas in the left emergency spillway.

NAME OF DAM: SOUTH RIVER No. 23

- 5) Clear brush from around the outlet structure and the lower water level to allow free drainage from the seepage drain. Place additional riprap as required.

NAME OF DAM: SOUTH RIVER No. 23

**APPENDIX I**

**PLATES**

**CONTENTS**

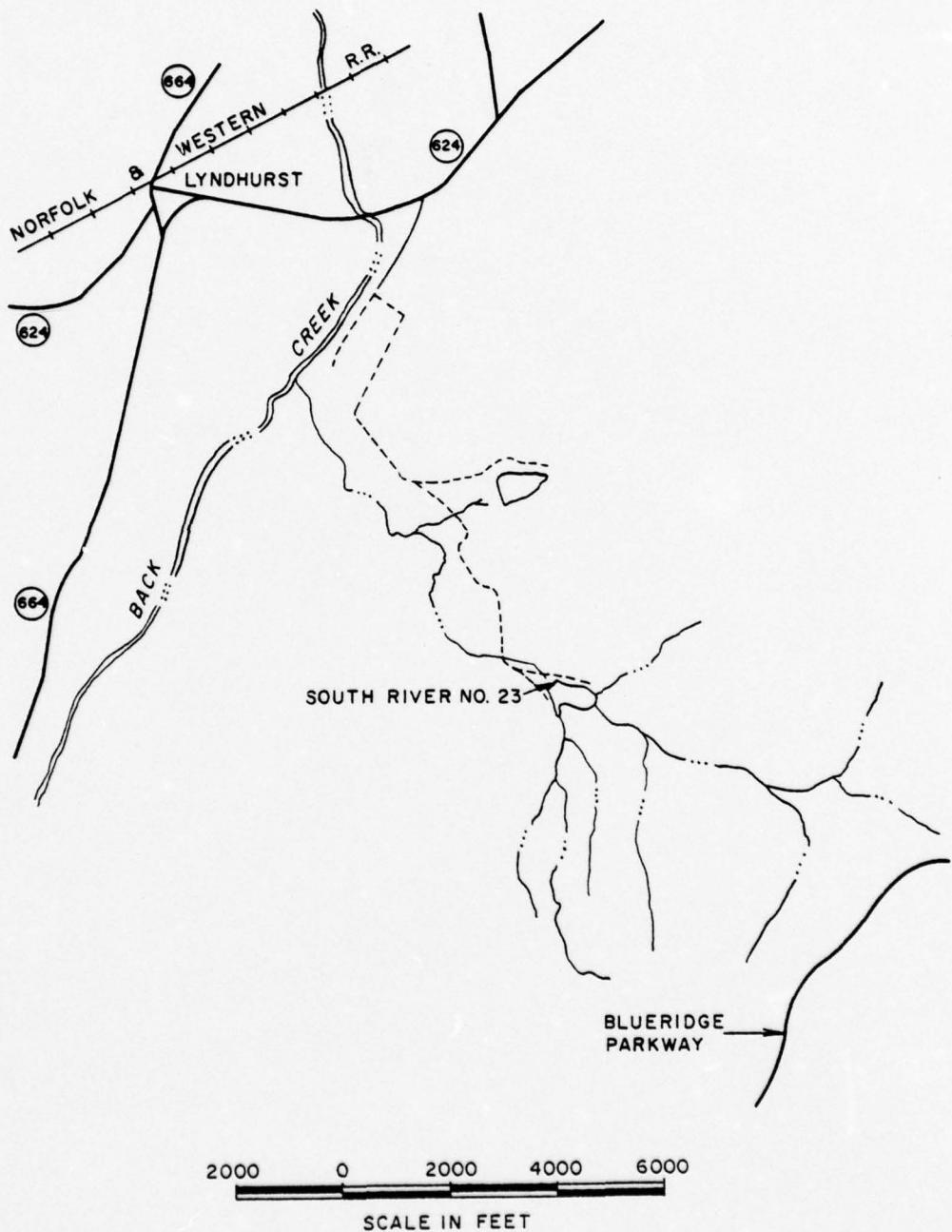
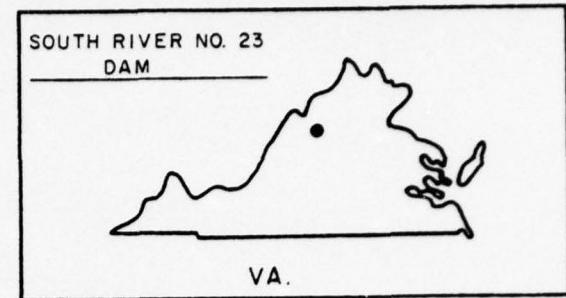
**Location Plan**

**Plate 1: Field Sketch**

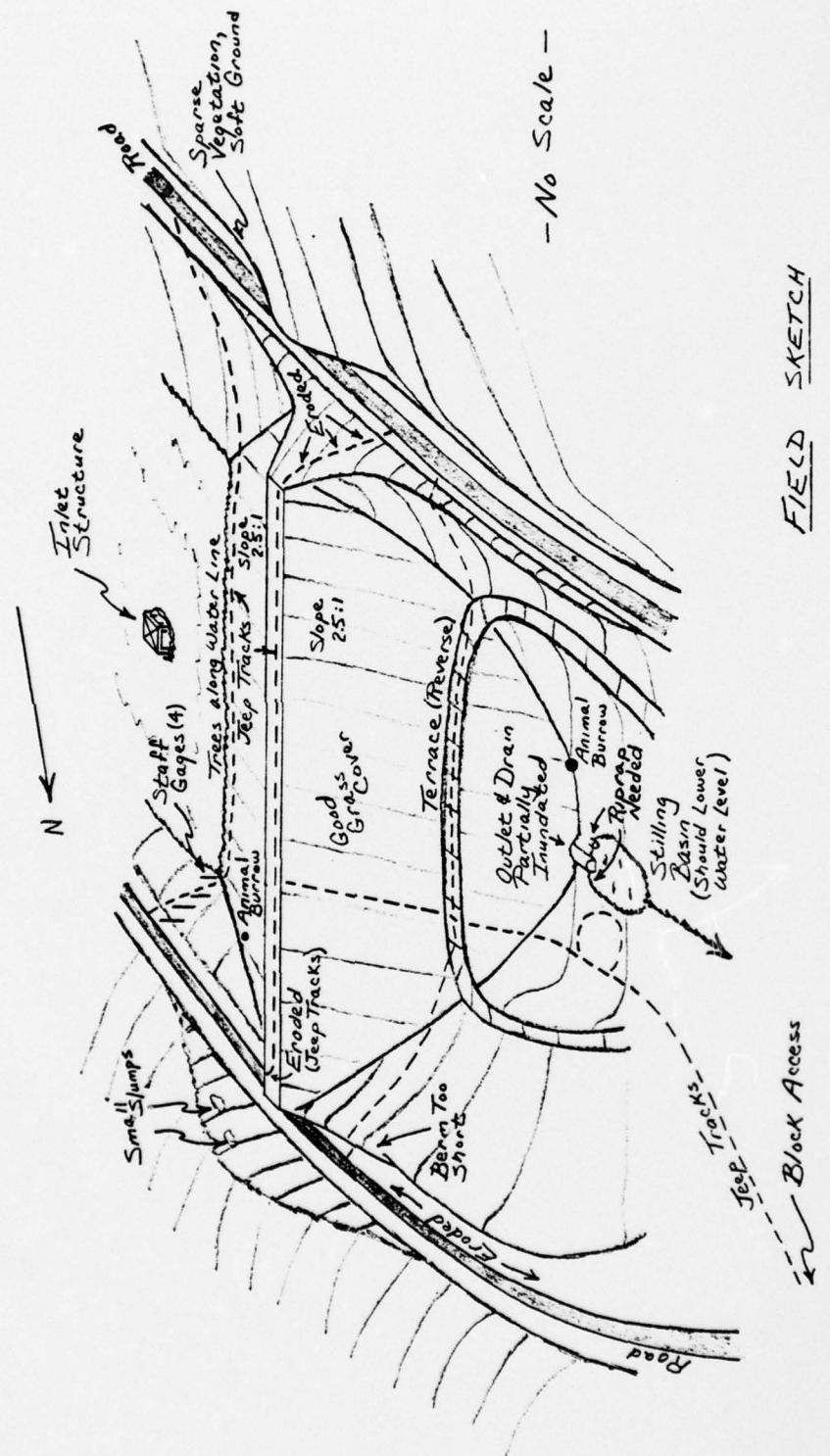
**Plate 2: Typical Dam Cross Section**

**Plate 3: Top of Dam and Spillway Profile**

**NAME OF DAM: SOUTH RIVER No. 23**



LOCATION PLAN  
SOUTH RIVER NO. 23 DAM

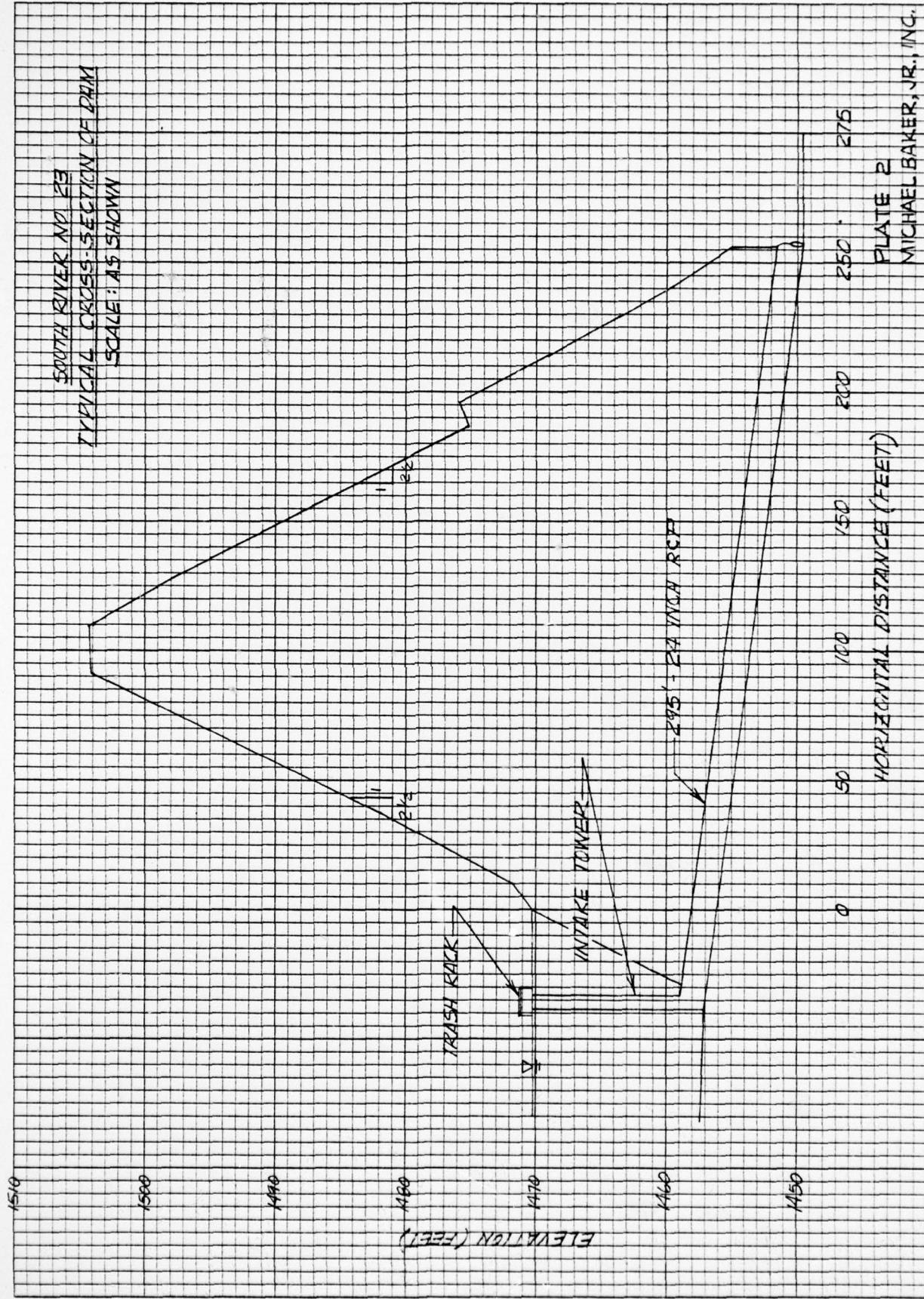


FIELD SKETCH  
 SOUTH RIVER #23, VIRGINIA  
 PLATE 1

Michael Baker, Jr., Inc.  
 7 June 1979

K-E 10 X 10 TO THE INCH • 7 X 10 INCHES  
KEUFFEL & ESSER CO. MADE IN U.S.A.

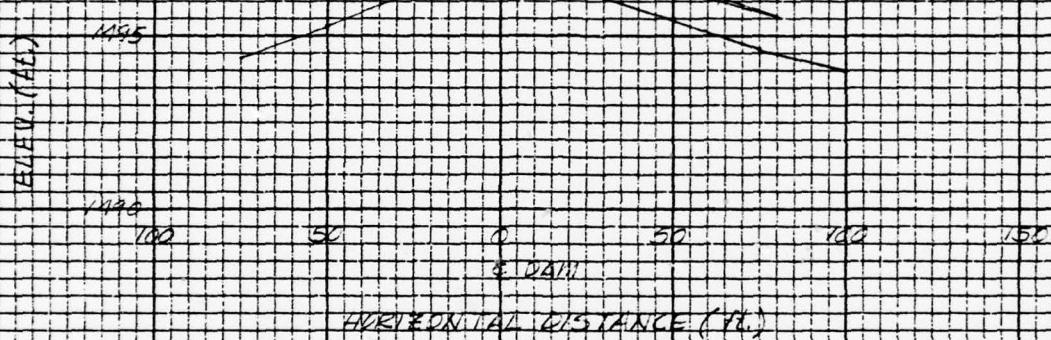
46 0703



TOP OF DAM PROFILE  
(Downstream View)



LEFT SPILLWAY PROFILE



RIGHT SPILLWAY PROFILE

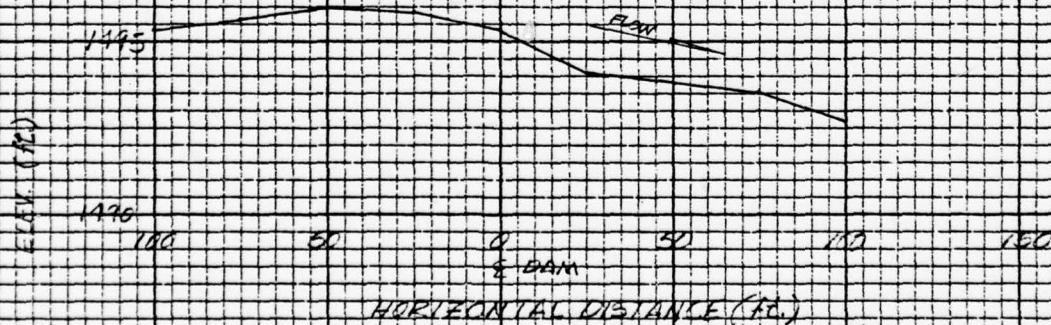


PLATE 3  
SOUTH RIVER NO. 25  
TOP OF DAM & SPILLWAY PROFILE  
MICHAEL BAKER, NR, INC.  
SCALE: AS SHOWN

**APPENDIX II**

**PHOTOGRAPHS**

## CONTENTS

- Photo 1: View of Downstream Embankment from Right Side of Dam
- Photo 2: Riser Structure Looking Upstream
- Photo 3: Close-up of Riser Looking Downstream
- Photo 4: Principal Spillway Outlet, Overgrowth, and Stilling Basin
- Photo 5: Upstream View of Left Emergency Spillway
- Photo 6: Discharge Channel of Right Emergency Spillway Looking Upstream
- Photo 7: Small Slumps in Hillside Cut of Right Emergency Spillway
- Photo 8: Downstream Channel from Crest of Dam

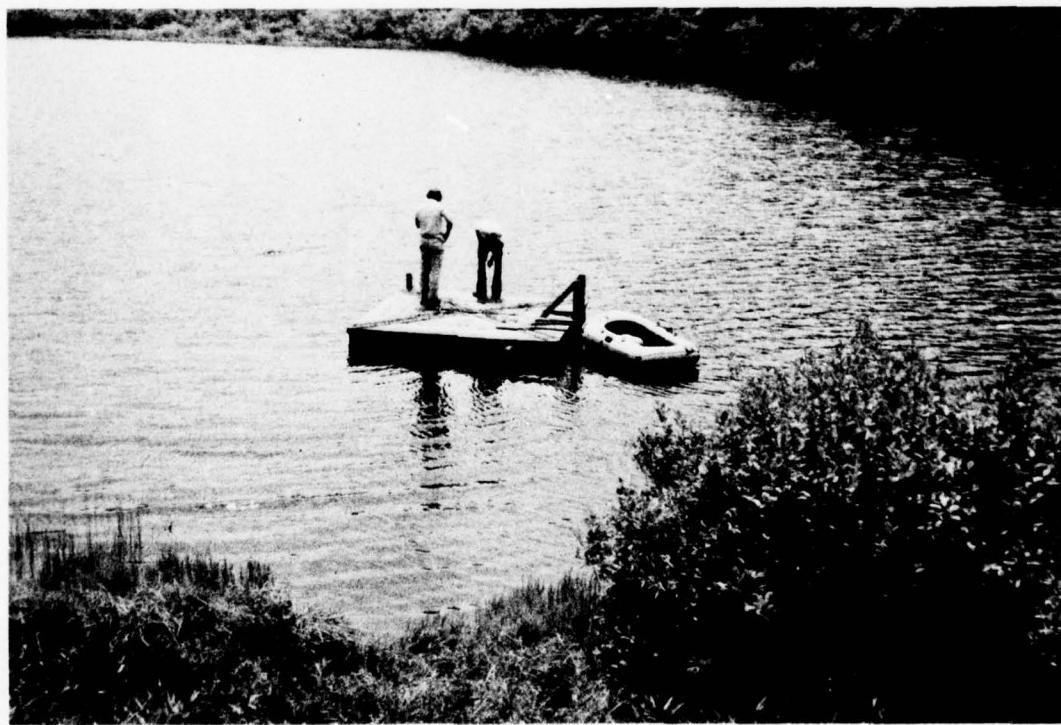
Note: Photographs were taken on 7 June 1979.

NAME OF DAM: SOUTH RIVER No. 23

**SOUTH RIVER No. 23 DAM**

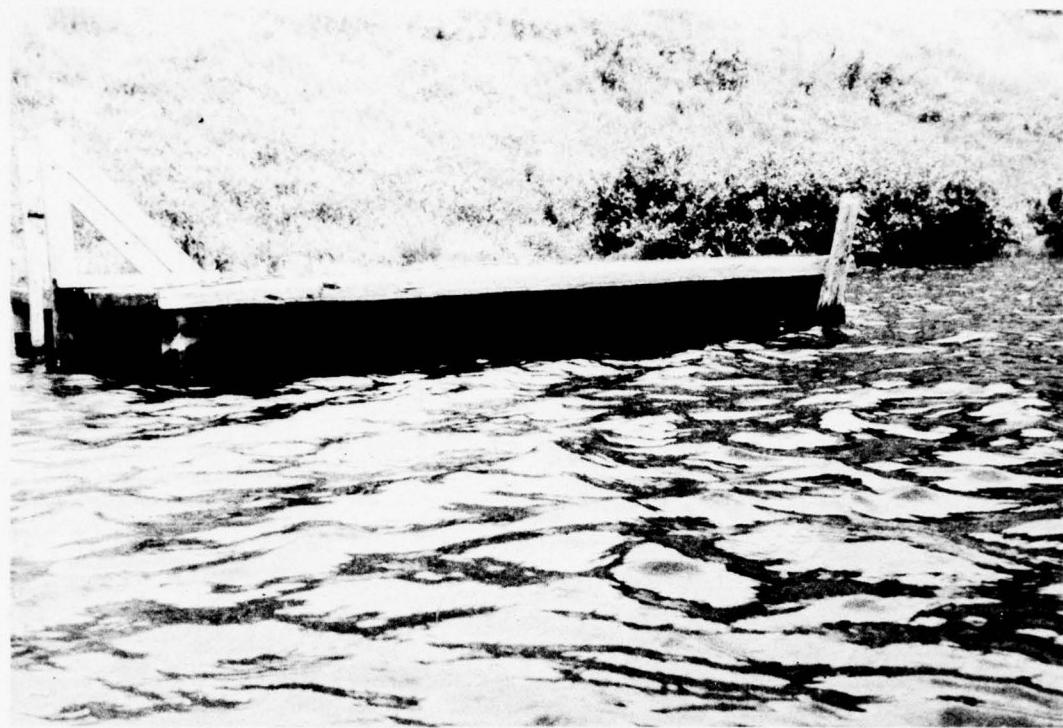


**PHOTO 1. View of Downstream Embankment from Right Side of Dam**



**PHOTO 2. Riser Structure Looking Upstream**

**SOUTH RIVER No. 23 DAM**



**PHOTO 3. Close-up of Riser Looking Downstream**



**PHOTO 4. Principal Spillway Outlet, Overgrowth, and Stilling Basin**

**SOUTH RIVER No. 23 DAM**



**PHOTO 5. Upstream View of Left Emergency Spillway**



**PHOTO 6. Discharge Channel of Right Emergency Spillway Looking Upstream**

**SOUTH RIVER No. 23 DAM**



**PHOTO 7. Small Slumps in Hillside Cut of Right Emergency Spillway**



**PHOTO 8. Downstream Channel from Crest of Dam**

**APPENDIX III**

**CHECK LIST - VISUAL INSPECTION**

Check List  
Visual Inspection  
Phase 1

Name of Dam South River No. 23 County Augusta State Virginia Coordinates Lat. 3800.3  
Long. 7855.2

Date of Inspection 7 June 1979 Weather Sunny Temperature 80°F.

Pool Elevation at Time of Inspection 1470.2 ft. M.S.L. Tailwater at Time of Inspection 1450.6 ft. M.S.L.

III-1

Inspection Personnel:

Soil Conservation Service:

Wayne Hypes

Michael Baker, Jr., Inc.  
T. W. Smith  
R. E. Holderbaum  
D. W. Hupe

Virginia Water Control Board:

Hugh Gildea

Owner's Representatives:  
George Hausler

Headwaters Soil and Water Conservation District:  
Folger Taylor

D. W. Hupe      Recorder

## EMBANKMENT

Name of Dam: SOUTH RIVER No. 23

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLoughing or Erosion of Embankment and Abutment Slopes	<p>The upstream embankment has a few sparsely vegetated areas.</p> <p>There is evidence of active jeep traffic. Erosion has occurred where the jeeps climb from the emergency spillways to the dam crest. They have driven directly up the downstream embankment. They have also driven across the downstream terrace and the upstream embankment just above the waterline from the abutments.</p> <p>H-H-2</p>	<p>Jeeps traversing the terrace on the downstream embankment could interrupt normal drainage of runoff and cause detrimental water pooling.</p> <p>The jeep traffic should be deterred. The related erosion should be repaired and seeded.</p>
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	There are no significant variations of vertical and horizontal alignment of the crest.	
RIPRAP FAILURES	There is no riprap at the waterline for wave dissipation, but no apparent damage has resulted.	Additional riprap is needed around the outlet pipe and the upstream side of the stilling basin.
VEGETATIVE COVER	Grass cover 3-4 ft. high. Some locust saplings (less than 6 feet high) are located on the downstream face of the dam and at the waterline on the upstream embankment.	Cut and remove the saplings.

Name of Dam: SOUTH RIVER No. 23

**EMBANKMENT**

<b>VISUAL EXAMINATION OF</b>	<b>OBSERVATIONS</b>	<b>REMARKS OR RECOMMENDATIONS</b>
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The junctions are in good overall condition. The emergency spillways handle all of the drainage from the hillsides, thus, the junctions only carry direct precipitation. The embankment/abutment junctions are not riprapped, but are not eroded.	Clear vegetation around the lowest gage and keep all gages in good repair.
ANY NOTICEABLE SEEPAGE	None observed	
III-3	Four gages are situated successively higher on the right upstream abutment slope. The lowest is being overgrown by vegetation.	
STAFF GAGE AND RECORDER		
DRAINS	One 8-in. C.M.P. outlet 2 ft. left of the dam outlet. The water is iron stained around this outlet. It cannot be determined if this drain is working because water backs up into this drain approximately 0.2 ft. from the stilling basin.	The stilling basin should be lowered so that the drain is free flowing.

Name of Dam: SOUTH RIVER No. 23

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Most of the outlet conduit could not be observed. The conduit was in good condition at its exit.	
INTAKE STRUCTURE	The intake structure, consisting of a reinforced concrete riser (5 ft. square) with a wooden plan top and trash rack, was in satisfactory condition.	
OUTLET STRUCTURE	No spalling of the exposed portions of the outlet conduit was observed.	
OUTLET CHANNEL	The outlet channel immediately around the outlet is heavily overgrown. There is insufficient riprap around the outlet pipe and the upstream side of the stilling basin. Water backs up into the outlet from the stilling basin so that 1/2 of the outlet is submerged.	Clear the vegetation around the outlet. Lower the level of the stilling basin. Riprap should be placed around the outlet and the upstream side of the stilling basin.
EMERGENCY GATE	A slide gate is located on the upstream side of the riser and is available to dewater the reservoir.	

Name of Dam: SOUTH RIVER NO. 23

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Not Applicable	
APPROACH CHANNEL	<p>There are two emergency spillways. The approach channels are unobstructed. Minor erosion has occurred in the approach channels due to the roads which traverse the spillways.</p> <p>The hillside cut of the right spillway opposite the dam crest has two small slumps and some unvegetated areas.</p> <p>The hillside cut of the left spillway approach channel is sparsely vegetated and soft. This area appears to be prone to slumping.</p>	<p>Vegetation should be established on the hillside cuts to stabilize the slopes and minimize erosion.</p> <p>The small slumps should be repaired and these areas should be inspected periodically to insure stability of the slopes and to prevent blockage of the spillways.</p>
DISCHARGE CHANNEL	<p>The berm separating the right spillway from the downstream embankment/abutment junction does not extend sufficiently far downstream. The road which traverses this discharge channel is moderately eroded.</p> <p>No deficiencies were observed in the discharge channel of the left spillway.</p>	<p>The road erosion should be repaired. The berm should be built up and lengthened to prevent flood waters from washing down the abutment slope prematurely onto the junction of the abutment and the embankment.</p>
BRIDGE AND PIERS	None	

Name of Dam: SOUTH RIVER No. 23

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Permanent markers were not found.	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

Name of Dam: SOUTH RIVER No. 23

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SLOPES	No unstable reservoir slopes were observed. No slumps were observed near the waterline.	
SEDIMENTATION	Only minor sedimentation is occurring.	

Name of Dam: SOUTH RIVER No. 23

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The downstream channel from the dam to the confluence with Back Creek is moderate, averaging approximately 1%. The watershed slopes adjacent to the stream valley are fairly steep.	
APPROXIMATE NO. OF HOMES AND POPULATION	Several homes are located in low-lying areas along Back Creek approximately 2 mi. downstream from the dam. Several summer homes are also located downstream from the dam, but are generally at higher elevations.	

**APPENDIX IV**

**CHECK LIST - ENGINEERING DATA**

CHECK LIST ENGINEERING DATA	
Name of Dam:	DESIGN, CONSTRUCTION, OPERATION
ITEM	REMARKS
PLAN OF DAM	Plate 1 illustrates the general Plan of Dam.
REGIONAL VICINITY MAP	The vicinity map is presented in this report as the Location Plan.
CONSTRUCTION HISTORY	The dam was engineered by the SCS and constructed by A. B. Burton in 1956.
TYPICAL SECTIONS OF DAM	A typical section was compiled during the visual inspection and is included as Plate 2.
HYDROLOGIC/HYDRAULIC DATA	None available
OUTLETS - PLAN, DETAILS, CONSTRAINTS, and DISCHARGE RATINGS	None available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: SOUTH RIVER No. 23

<u>ITEM</u>	<u>REMARKS</u>
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available

POST-CONSTRUCTION SURVEYS OF DAM    No known post-construction surveys were found.

BORROW SOURCES    The borrow sources are unknown.

Name of Dam: SOUTH RIVER No. 23

ITEM	REMARKS
MONITORING SYSTEMS	No monitoring systems are provided other than the four staff gages situated on the upstream right abutment.
MODIFICATIONS	There does not appear to have been any modifications.
HIGH POOL RECORDS	None available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None available
Maintenance OPERATION RECORDS	Included in Appendix V.

Name of Dam: SOUTH RIVER No. 23

<u>ITEM</u>	<u>REMARKS</u>
SPILLWAY PLAN,	
SECTIONS, and DETAILS	None available
OPERATING EQUIPMENT PLANS & DETAILS	None available

**APPENDIX V**

**OPERATION AND MAINTENANCE INSPECTION REPORTS**

*Lester Pence*  
USFS

ANNUAL MAINTENANCE INSPECTION OF STRUCTURAL WORKS OF IMPROVEMENT  
Shenandoah Valley Soil & Water Conservation District

April, 1970

Maintenance inspections were conducted on structural works of improvement in the Shenandoah Valley District. The following needs of repair and improvement were noted:

Site #27 - Sherando

Stillin basin needs cleaning out to lower water level 2 to 3 feet. Washed cut section in exit section of emergency spillway needs to be backfilled and seeded. Washed-out section approximately 1' deep, 40' long and 2' wide. (Forest Service indicated they would do this repair work.)

Site #25 - Tom's Branch

Cattle grazing needs to be controlled on dam and in emergency spillway. Fertilizer on the emergency spillway would revive the vegetation quickly now if the grazing could be controlled.

Site #11

Trees need to be cut on dam and in emergency spillway. When cut the stumps should be killed.

Site #7

Controlled grazing would improve the maintenance of this structure.

Site #23 - Robinson Hollow

Locust trees on dam and in emergency spillway need to be cut and killed.

Site #26 - Inch Branch

Locust trees on dam need to be cut and killed. Trash on river top needs to be removed.

*Elkhorn Lake*  
Sites # 76 and 77 - Heart's Ease

Locust trees on dam should be cut and killed.

APPROVED:

*David Walker*

David Walker, Chairman  
Shenandoah Valley SWCD  
April 5, 1970  
May

*Wm. L. Blair, Jr.*  
Wm. L. Blair, Jr.  
Area Conservationist  
April 27, 1970

*John L. B.*  
U. S. Forest Service  
April 30, 1970

OPERATION AND MAINTENANCE INSPECTION

of

South River Watershed Structures

An inspection team of Jackson Betts, Wayne Hypes, John Crist, Folger Taylor, and William E. Lucas, Jr. on April 5, 1978, visited the following dams of the South River Watershed of the Potomac River Watershed.

Site #3 - Greenville Correction Center - The dam is in good shape with good vegetative cover and has been mowed. Posts have been set to indicate firing stations in the emergency spillway and using the spillway bank as a pellet stop. When the firing training is completed the posts should be removed. This structure is being used rather wisely.

Site #4 - Kiwanis Lake - The spillway pipe and riser appear to be in good shape. All of the dam has been mowed. The Ky 31 is becoming thin on the front of the dam (wet side) and needs to be overseeded with Ky 31 and fertilized. The road on the top of the dam needs to be graveled on the steeper parts. The back part of the dam (dry side) has some woody growth that should be cut and deadened. There is about 1 Ac. that needs to be seeded to Ky 31. The entire dam and emergency spillway area should be limed and fertilized.

Site #6 - Sangers Lake - This structure is kept mowed. Some overseeding of Ky 31 would be helpful. Some Crownvetch has been started on it. The riser and spillway pipe appear to be in good shape. The berm is showing effects of wave erosion and would be improved by shaping with large stone.

Site #7 - Wilda - This dam has received much attention, such as brushhogging, Fall spraying for knapweed, Spring seeding of Ky 31, application of 10-10-10 fertilizer, and the owner will spot spray for weeds this growing season. The riser and pipe spillway appear to be in good shape, but the slide gate control rod and gate frame show much rust when the lake level is low.

Site #11 - Canada Run - County Dump - The woody growth was cut and sprayed last year. This dam should be mowed this year. The riser, pipe spillway and emergency spillway appear to be sound.

Site #24 - Happy Hollow Lake - This site has good vegetative cover and is kept mowed. The riser and pipe spillway appear sound. The emergency spillway is in good condition with good cover. The wooden trash rack is scheduled to be replaced.

Site #25 - Toms Branch - This dam has very little woody growth on it. The pipe spillway and emergency spillway are in good condition. Stone has been applied to the road on the dam and has improved the dam by eliminating the standing water on the top of the dam. This dam should be mowed in the next two years. The road banks above the dam (road going to Shirey camp) should be seeded to cut down the silt and erosion.

*Wayne Hypes*

Operation and Maintenance Inspection

-2-

Site #23 - Robinson Hollow - The vegetative cover is thinning out and the locust should be killed before they get out of control. The riser and pipe spillway are in good shape. The trash rack is scheduled to be replaced. The road in the emergency spillway should be watched as the ruts are hard to control. A mowing schedule should be followed. This site was overseeded with Sericea Lespedeza this Spring.

Site #26 - Inch Branch - The wooden trash rack is scheduled to be replaced. The pipe spillway and emergency spillway appear to be sound. The vegetative cover on the dam and emergency spillway is in satisfactory condition.

Site #19 - Waynesboro Nursery - This site has good vegetative cover except the cattle tracks which have become ruts should be healed over. The pipe spillway and emergency spillway appear to be sound. Thistle appear to be a problem on this dam and since they are dormant much of the winter they permit the soil when freezing and thawing to heave and then erode. A grass should be seeded in the thistle place after thistle have been eradicated.

On April 13, 1978, Sites 10A and 27 of the South River Watershed of the Potomac Watershed were inspected by Wayne Hypes, Folger Taylor, and William Lucas, Jr.

Site #10A - Mills Creek - This is a multiple purpose site so arrangements were made to meet with representatives from the Augusta County Service Authority but they did not show so we continued on the day's objective. The woody growth needs to be cut. It does not appear to have received any attention last year. The spillway pipe and riser appear to be in good shape. The emergency spillway is not showing much erosion but the cover is very sparse. The fill is taking a beating from abuse by off-the-road activities and the vegetation is being destroyed. The fill is also being rutted by attempting to have hill climbs when too wet. There should be toe drains re-established to eliminate the seep areas at the base of the dam. The borrow areas need seeding attention as well as some supervision by civil authorities of recreation pursuits. The areas are being abused.

Site #27 - Upper Sherando Lake - David Frazier, USFS, accompanied the inspection team on this dam. Much work has been carried out on this dam. The woody growth has been cut and destroyed. The dam has had 1200 lbs. fertilizer, 40 lbs. Ky 31 and 10 lbs. Sericea Lespedeza seed on it. The structure appears sound. The following suggestions came out of discussions with persons present to make for better use of the recreational potential:

1. The berm area be covered with crushed stone, here and on future dual-purpose structures.
2. New parking areas be established below dam with paths established using flattened logs or rail ties as steps.

*Wayne M. Hypes, Jr.  
William E. Lucas, Jr.*

**APPENDIX VI**

**GENERAL REFERENCES**

#### GENERAL REFERENCES

1. Bureau of Reclamation, U.S. Department of the Interior, Design of Small Dams, A Water Resources Technical Publication, Revised Reprint, 1977.
2. Chow, Ven Te, Handbook of Applied Hydrology, McGraw - Hill Book Company, New York, 1964.
3. Chow, Ven Te, Open Channel Hydraulics, McGraw - Hill Book Company, New York, First Edition, 1959.
4. Commonwealth of Virginia, "Geologic Map of Virginia," Department of Construction and Economic Development, and Division of Mineral Resources, 1963.
5. HR 33, "Seasonal Variations of Probable Maximum Precipitation, East of the 105th Meridian for Areas 10 to 1000 Square Miles and Durations of 6 to 48 Hours," (1956).
6. King, Horace Williams and Brater, Ernest F., Handbook of Hydraulics, Fifth Edition, McGraw - Hill Book Company, New York, 1963.
7. Soil Conservation Service, "National Engineering Handbook - Section 4, Hydrology," U.S. Department of Agriculture, 1964.
8. Soil Conservation Service, "National Engineering Handbook - Section 5, Hydraulics," U.S. Department of Agriculture.
9. U.S. Army, Hydrologic Engineering Center, "Flood Hydrograph Package (HEC-1), Dam Safety Investigations, Users Manual," Corps of Engineers, Davis, California, September 1978.
10. U.S. Army, Hydrologic Engineering Center, "HEC-2 Water Surface Profiles, Users Manual," Corps of Engineers, Davis, California, October 1973.
11. U.S. Army, "Inventory of United States Dams," Corps of Engineers, 9 September 1978.
12. U.S. Army, Office of the Chief of Engineers, "Appendix D, Recommended Guidelines for Safety Inspection of Dams," National Program of Inspection of Dams, Volume 1, Corps of Engineers, Washington, D.C., May 1975.

NAME OF DAM: SOUTH RIVER No. 23

VI-1

13. U.S. Army, Office of the Chief of Engineers, Engineering Circular EC-1110-2-163 (Draft Engineering Manual), "Spillway and Freeboard Requirements for Dams, Appendix C, Hydrometeorological Criteria and Hyetograph Estimates," (August 1975).
14. U.S. Army, Office of the Chief of Engineers, Engineering Circular EC-1110-2-188, "Engineering and Design, National Program of Inspection of Non-Federal Dams," Corps of Engineers, Washington, D.C., 30 December 1977.
15. U.S. Army, Office of the Chief of Engineers, Engineer Technical Letter No. ETL 1110-2-234, "Engineering and Design, National Program of Inspection of Non-Federal Dams, Review of Spillway Adequacy," Corps of Engineers, Washington, D.C., 10 May 1978.
16. U.S. Department of Commerce, "Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Weather Bureau, Washington, D.C., May 1961.

NAME OF DAM: SOUTH RIVER No. 23

VI-2